GREEN ROOFS

WHAT ARE THEY? Green roofs or vegetated rooftops have been extensively used in northern Europe since the 1970s and are now gaining popularity in North America. Also called *landscaped roofs, roof gardens*, and *eco-roofs*, green roofs consist of waterproofing and drainage mats, a special growing media, and plants able to withstand extreme climates. They offer several real and potential benefits, including reduced runoff, increased evapotranspiration, prolonged roof life, reduced roof temperature, decreased energy costs, and reduction of the *urban heat island* – the area of higher temperatures that exists around intensely developed and densely paved urban areas. Green roofs also help to meet aesthetic and landscaping requirements, and they can create additional living space if constructed to bear the weight of people and their outdoor activities. The possibilities of so many benefits – particularly in urban, high-density environments, such as uptown Charlotte and downtown Raleigh – have triggered the use of green roofs.

Figure 3. Extensive (A) and Intensive (B) green roofs. The plant growing on the extensive green roof (A) is a sedum, a type of succulent. The intensive green roof (B) is the North Carolina State Government Plaza between the Archdale Building and the Legislative Building in downtown Raleigh. Hundreds of people walk across this green roof, which is on top of a parking deck, every weekday. *(BAE, N.C. State University)*

The main drawback to green roofs is their construction cost, which ranges from $12 to $25 per square foot more than conventional roofs. Costs are high for green roofs because the materials used are expensive and difficult to transport onto the building, and they require more structural reinforcement than other roofing materials.

There are two general types of green roofs: extensive and intensive (Figure 3). An *extensive green* roof can be thought of as a vegetated carpet. This roof type is covered in engineered soil (media),typically 3 to 5 inches thick, with low-lying vegetation growing across it. An extensive green roof is generally much less expensive to construct and maintain than an intensive green roof. It requires only a little maintenance, and it is not constructed to hold and support large groups of people.

Intensive green roofs are garden-like. They can be designed to grow trees and shrubs because of their deep soil layer, and they can carry pedestrian traffic. They are typically very expensive to construct and require more intense maintenance, such as irrigation and fertilization. Intensive green roofs often cover underground parking decks.

The most common type of green roof used in North Carolina is extensive. One concern with extensive roofs, however, is the type of plant that is able to survive on it. A rooftop is usually a dry and barren environment, making it very difficult for native N.C. plants to survive without supplemental irrigation. Succulents, relatives of the cactus family, can thrive on nonirrigated green roofs. But because the vast majority of these species are not native to North Carolina, many potential users are wary of introducing non-native plants that might migrate to the ground and invade native vegetation. Those fears, however, should be minimized when considering whether to use a green roof. On the ground, where most soils are wetter and denser than on a roof, native N.C. plants can out-compete the succulents that survive on a desert-like rooftop.